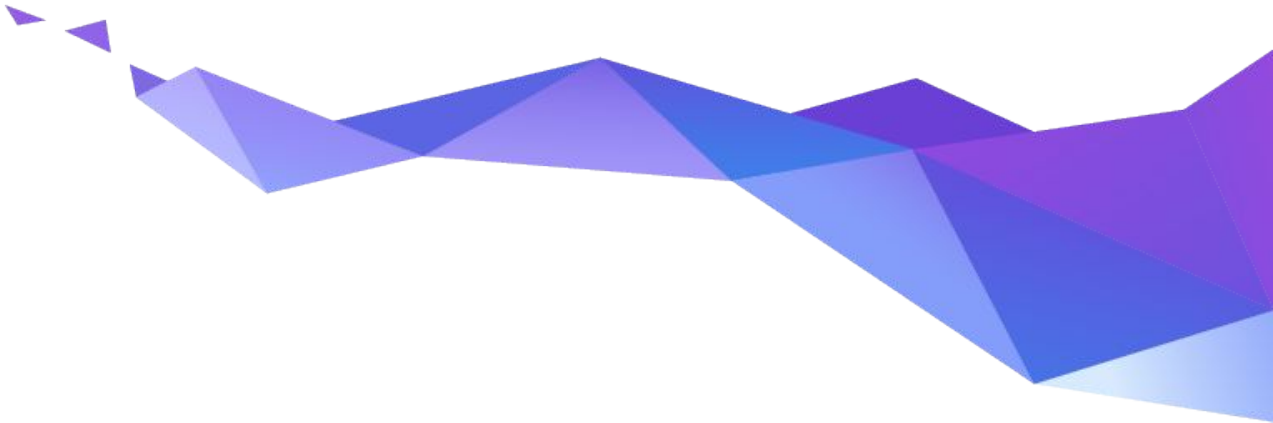
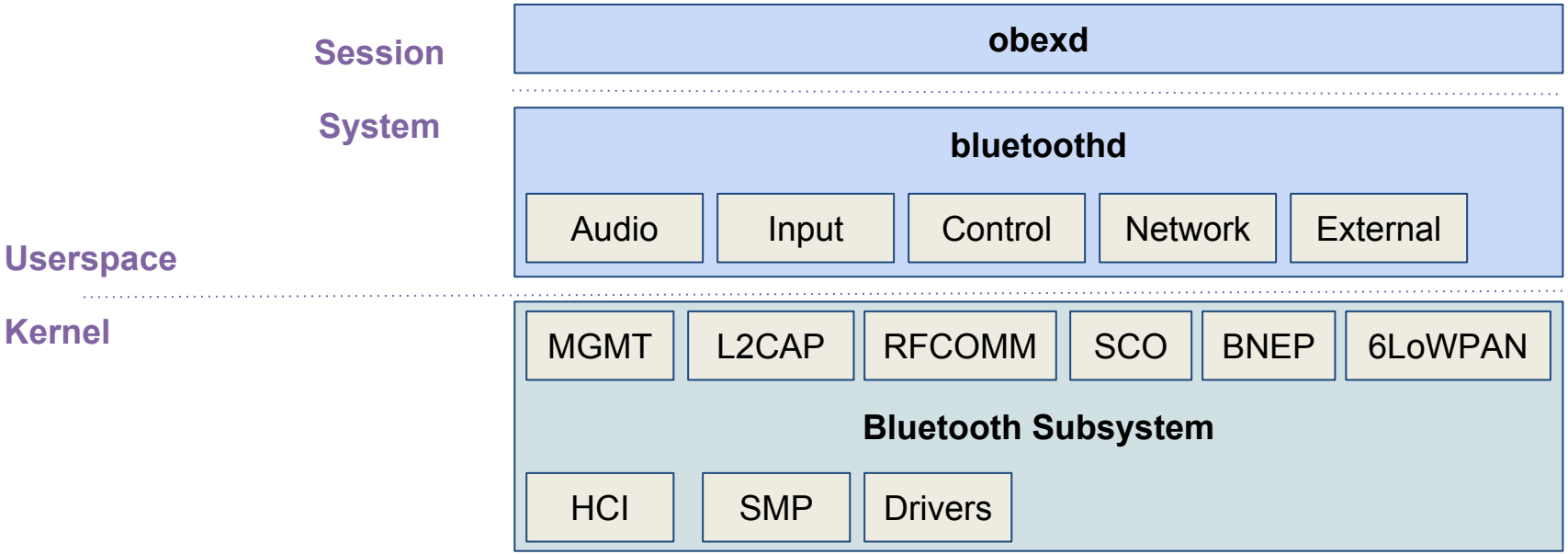
Zephyr Project

BlueZ meets Zephyr

Luiz Von Dentz
Intel Corporation



BlueZ - Linux Bluetooth

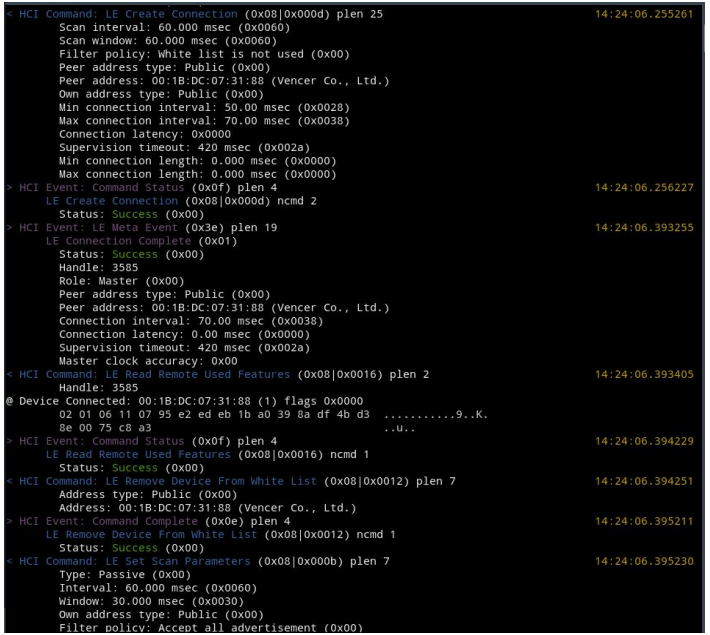


Proxy

- **tools/btproxy**
- **Use user-channel**
- **HCI UART proxying**
- **Local/Unix and TCP socket**

Monitoring

- HCI tracer
- Replaces hcidump
- Support multiple adapters
- Logs early commands including setup phase
- Support including logs such as syslog and crash backtrace
- Can monitor adapters connected to virtual machines
- Can monitor using a TTY



Management

- Replaces hciconfig
- Low level interface - kernel
- Requires permissions
- Can tweak settings such as mode, etc.
- Changing settings may interfere with bluetoothd

Controlling

- **BlueZ command line tool client**
- **Replaces hcitool**
- **Can exercise most of the BlueZ APIs:**
  - Scan
  - Advertise
  - Connect
  - Pair
  - Read/Write attributes
  - Enable notifications

```
[bluetooth]# connect 00:1B:DC:07:31:88
Attempting to connect to 00:1B:DC:07:31:88
[CHG] Device 00:1B:DC:07:31:88 Connected: yes
Connection successful
[NEW] Primary Service
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001
        Eddystone Configuration Service
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0002
        Capabilities
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0004
        Active Slot
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0006
        Advertising Interval
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0008
        Radio Tx Power
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char000a
        (Advanced) Advertised Tx Power
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char000c
        Lock State
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char000e
        Unlock
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0010
        Public ECDH Key
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0012
        EID Identity Key
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0014
        ADV Slot Data
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0016
        (Advanced) Factory reset
[NEW] Characteristic
        /org/bluez/hci0/dev_00_1B_DC_07_31_88/service0001/char0018
        (Advanced) Remain Connectable
[CHG] Device 00:1B:DC:07:31:88 UUIDs: a3c87500-8ed3-4bdf-8a39-a01bebede295
[CHG] Device 00:1B:DC:07:31:88 ServicesResolved: yes
[CHG] Controller 7C:7A:91:18:82:46 Discovering: yes
[CHG] Controller 7C:7A:91:18:82:46 Discovering: no
```

Zephyr Tests and Samples

- **tests/bluetooth**:
  - shell
  - tester
- **samples/bluetooth**:
  - beacon
  - central
  - eddystone
  - ipsp
  - peripheral_{csc, dis, esp, hr, hids}

Demos

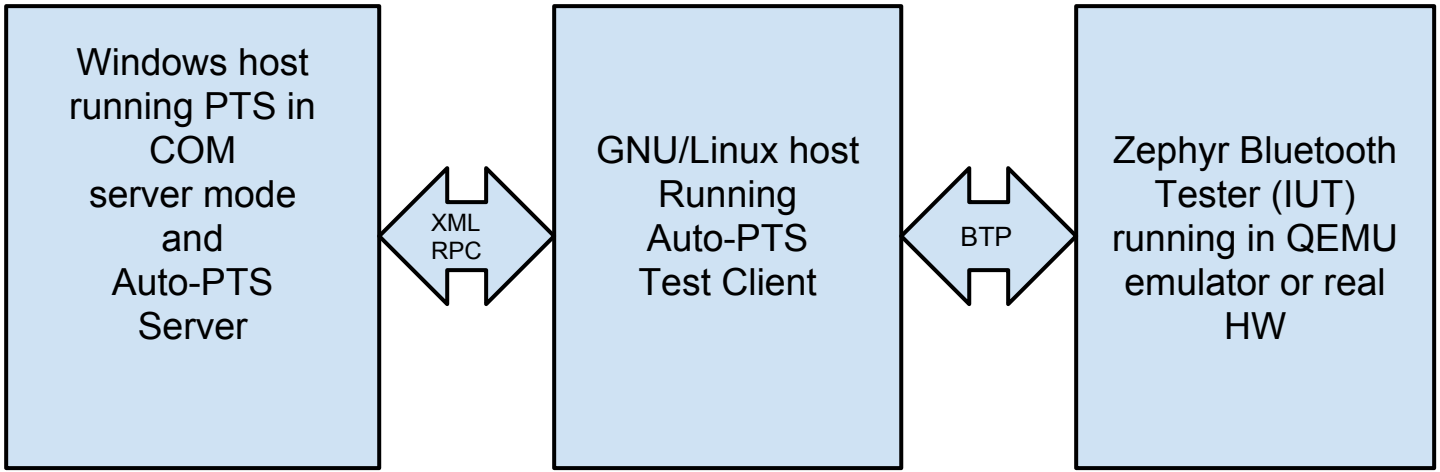
Bluetooth PTS

- **Bluetooth Profile Tuning Suite**:
  - software-based black-box testing tool that automates protocol and profile interoperability testing.
- **Implements test specifications**
- **Mandatory for qualification**
- **Windows only**
- **Requires some level of expertise in order to execute tests with its user interface**
- **Newer versions support PTSControl COM API for extended automating**

PTS automation architecture

- **server**: It is implemented in Python and executed using IronPython
- **client**: runs on GNU/Linux, communicates with the auto-pts server (to start/stop test cases, to send response to PTS inquiries) and communicates with the IUT (Implementation Under Test) to take appropriate actions. It is implemented in Python and executed using CPython.
- **Implementation Under Test (IUT)**: It is the host running Zephyr Bluetooth stack to be tested, this could be an emulator or real hardware.
- **Bluetooth Test Protocol (BTP):** Used to communicate with the IUT.

Architecture diagram



Example test case

```
ZTestCase("GAP", "TC_DISC_NONM_BV_02_C",
                [TestFunc(btp.core_reg_svc_gap),
                 TestFunc(btp.gap_read_ctrl_info),
                 TestFunc(btp.wrap, pts.update_pixit_param,
                          "GAP", "TSPX_bd_addr_iut",
                          btp.get_stored_bd_addr)]
                 TestFunc(btp.gap_adv_ind_on, start_wid=72)]),
```

Current results

- **260 test cases automated**:
  - GAP 41
  - GATT client 76
  - GATT server 87
  - SM 34
  - L2CAP 22
- **Pass rate**:
  - PASS 248 (95.38%)
  - FAIL 5 (1.92%)
  - PTS ISSUE 7 (2.69%)


Zephyr
Project
Questions?